FOR ADMINISTRATIVE USE

CDC INFLUENZA SURVEILLANCE REPORT

NO. 23 OCTOBER 28, 1957

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SPECIAL NOTE

Information contained in this report is a summary of data reported to CDC by State Health Departments, Epidemic Intelligence Service Officers, collaborating influenza diagnostic laboratories, and other pertinent sources. Much of it is preliminary in nature and is intended for those involved in influenza control activities. Anyone desiring to quote this information is urged to contact the person or persons primarily responsible for the items reported in order that the exact interpretation of the report and the current status of the investigation be obtained. State Health Officers, of course, will judge the advisability of releasing any information from their own states.

Table of Contents

I. Summary of Information

At least 652 counties have now reported influenza since the first appearance of the Asian strain virus in the United States. This represents 21.2% of the counties of the nation. Of this number 119 have experienced community-wide epidemics. All sections of the country are more or less involved now although the Plains States, with low population densities, remain least affected. North Dakota remains the only state apparently free of Asian strain influenza.

Industrial reports show increases in absenteeism for 23 of the 36 reporting cities. Pacific Coast and Plains State cities represent the largest number not yet reporting increased absenteeism. Two cities, Phoenix and Cincinnati, which previously reported increased industrial absenteeism have returned to normal rates for this season. First reports of increases continue to occur one to two weeks after the appearance of school outbreaks in the cities.

Summaries of influenza-associated deaths (5 from Ohio, 3 from New Jersey, and 1 from the District of Columbia) are presented in this report. Four of these summaries illustrate the phenomenon of sterile pneumonia. It must be re-emphasized that CDC is not reporting all, or even a large portion, of the influenza-associated deaths in this country.

A total of 27,156,487 ml. of Asian strain influenza vaccine has been released through October 24. This includes 4,391,051 ml. released since October 16.

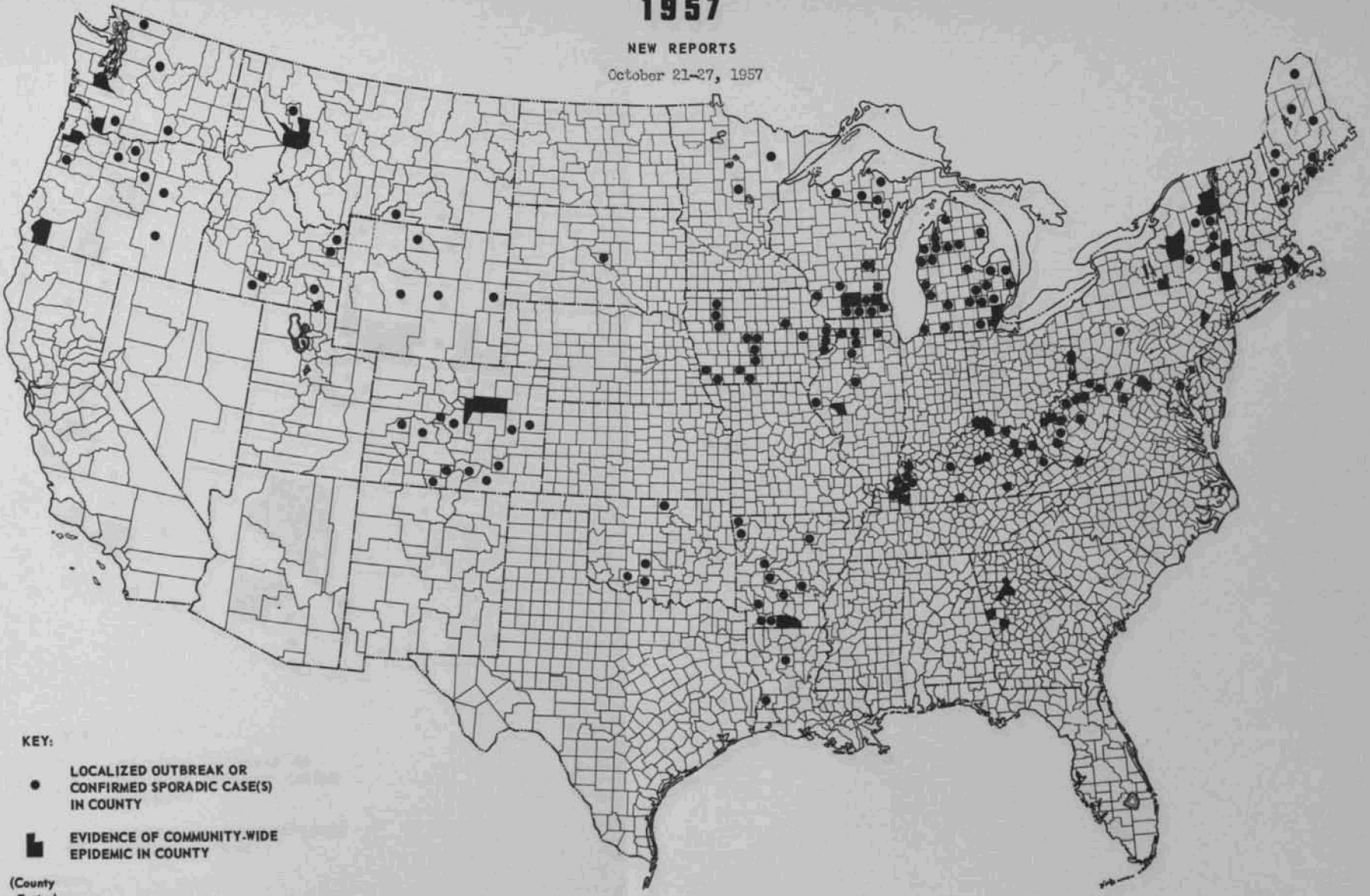
Excess mortality for the United States as a whole continues its steady rise. The total excess for all divisions for the week ending October 26 is approximately 400 deaths (using the same week in 1954, 1955, and 1956 for comparison). The greatest relative increases are occurring in the South Atlantic, Middle Atlantic, East North Central, and New England divisions.

A somewhat speculative discussion of the spread of Asian strain influenza within the community is included in the Epidemic and Case Reports section. It is pointed out that many areas have noted that their first outbreaks affected high school children. Elementary school children are affected a few days later, and adults are not involved to any extent for another one to two weeks. Industrial absentee data supports these observations (at least for urban areas).

ASIAN STRAIN INFLUENZA
1957

NEW REPORTS

October 21-27, 1957



KEY:

- ● **LOCALIZED OUTBREAK OR CONFIRMED SPORADIC CASE(S) IN COUNTY**
- ▙ **EVIDENCE OF COMMUNITY-WIDE EPIDEMIC IN COUNTY**

(County Entirely Black)

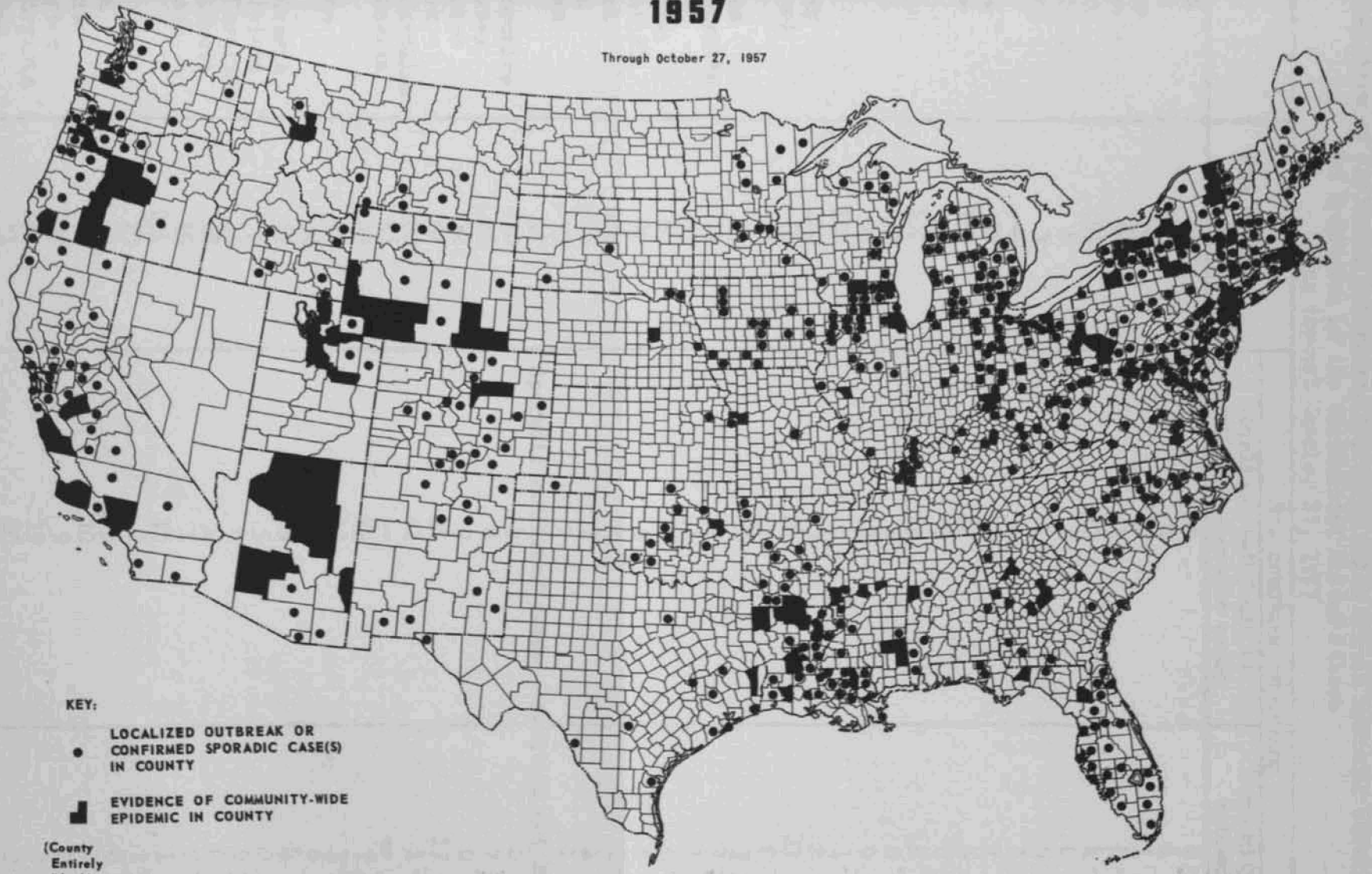
DHEW-PHS-CDC

ATLANTA, GA. - APRIL, 1958

ASIAN STRAIN INFLUENZA

1957

Through October 27, 1957



DHEW-PHS-CDC

ATLANTA, GA. - APRIL, 1958

Tabulation of Influenza Outbreaks, Confirmed Asian Strain Sporadic Cases, and Epidemics in the Continental United States
June through October 27, 1957

State	No. counties in state	No. counties reporting	
		Localized outbreaks or confirmed sporadic cases	Community-wide epidemics
Alabama	67	5	1
Arizona	14	4	4
Arkansas	75	12	1
California	58	31	4
Colorado	63	17	4
Connecticut	8	7	0
Delaware	3	1	0
D. C.	—	—	1
Florida	67	25	2
Georgia	159	12	5
Idaho	44	7	0
Illinois	102	15	4
Indiana	92	5	0
Iowa	99	18	0
Kansas	105	2	1
Kentucky	120	23	2
Louisiana	64	24	11
Maine	16	14	0
Maryland	23	7	3
Massachusetts	14	7	2
Michigan	83	41	1
Minnesota	87	10	0
Mississippi	82	6	6
Missouri	114	2	1
Montana	56	7	1
Nebraska	93	1	1
Nevada	17	Sporadic confirmed cases - counties not known	
New Hampshire	10	2	0
New Jersey	21	8	7
New Mexico	32	9	0
New York	62	28	17
North Carolina	100	21	1
North Dakota	53	—	—
Ohio	88	25	7
Oklahoma	77	10	1
Oregon	36	14	6
Pennsylvania	67	25	4
Rhode Island	5	5	0
South Carolina	46	4	0
South Dakota	68	4	0
Tennessee	95	1	0
Texas	254	10	1
Utah	29	2	7
Vermont	14	5	0
Virginia	98	10	2
Washington	39	9	2
West Virginia	55	19	2
Wisconsin	71	10	3
Wyoming	23	9	4
Totals:	3068	533	119

II. Influenza Maps and Table

At least 21.2% of the counties of the United States have reported influenza outbreaks or epidemics to date. Of the 652 counties, 533 have reported localized outbreaks or confirmed Asian strain sporadic cases; and 119 have experienced community-wide outbreaks by our criteria (see CDC Influenza Surveillance Report No. 21, page 3, for a discussion of these criteria). In the past week 176 counties have been added to the table and maps, including 25 with community-wide epidemics.

In New England, Maine has now experienced outbreaks in all but two of its counties; and epidemic influenza continues to spread in Massachusetts, Rhode Island, and Connecticut.

New York State leads the nation with 17 counties reporting community-wide epidemics. Other northeastern states report continuing heavy involvement. In the Midwest, Michigan, Illinois, Wisconsin, and Iowa report many new county outbreaks. North Dakota remains the only state apparently free of influenza. In the South, West Virginia, Arkansas, and Kentucky reported large numbers of new outbreaks last week, primarily among school children. It is of interest that Louisiana has reported a number of new school outbreaks in the past week or two in the northern parishes.

Many new western county reports have come to CDC from Colorado, Wyoming, Idaho, and Oklahoma. On the Pacific Coast, influenza epidemics have now appeared in Washington as well as Oregon. California reports school outbreaks in many counties but the community-wide epidemic situation in the state is not clear at this writing.

III. Epidemic and Case Reports

1. Spread of Influenza in the Community

With the large number of reports that now arrive at CDC weekly, it is possible to make some speculative generalizations about the spread of Asian strain influenza through the community.

Almost every first report from a town or county now comes from a school where high absenteeism makes the presence of an influenza outbreak readily apparent. Only a small proportion of the first reports come from military installations, camps, prisons, and the like. The school outbreaks do not, however, occur in school children of all ages simultaneously. Many communities have noted that the first outbreaks seem to appear among high school children. The elementary schools report increases of absenteeism a few days later. These observations have been made in a number of states, including Pennsylvania, New York, Louisiana, Mississippi, Michigan, and Arizona. For example, Dr. W. D. Schrack, Pennsylvania Department of Health, and Dr. H. B. Dull, EIS Officer, report the following information from Connellsville, Pennsylvania:

Number of Pupils Absent

Date	Senior High School (1100 pupils)	Junior High School (1308 pupils)	Elementary School (1235 pupils)
Sept. 29	---	---	---
Sept. 30	98	119	---
Oct. 1	144	149	---
Oct. 2	200	168	---
Oct. 3	315	233	---
Oct. 4	424	286	135
Oct. 7	617	742	305
Oct. 8	550	754	358
Oct. 9		(Schools closed)	

(--- Normal absentee rate)

It seems likely that in most areas spread into the adult population to any great extent takes place only one to two weeks or more after the school outbreaks are first reported in the community. This impression is supported by the upswings of industrial absenteeism some one to two weeks after the onsets of school outbreaks in many of the cities in the CDC industrial reporting system. Finally, after the industrial absenteeism swings upward, there is another short lag before excess mortality begins to increase. This lag perhaps represents the duration of illness--culminating in death--after onset of illness nearer the time of increase in industrial absenteeism.

2. Louisiana

Report from Charity Hospital, New Orleans

(Data provided by Hospital Staff and Dr. John M. Bruce, La. Dept. of Health)

Patients seen in the Admitting Room and the number with influenza-like illness.

Week Ending	NEGRO Total Patients Seen	NEGRO Flu-like Illness	NEGRO % of Total	WHITE Total Patients Seen	WHITE Flu-like Illness	WHITE % of Total
Aug. 10	2724	206	7.5	882	19	2.1
Aug. 17	2850	391	13.6	850	38	4.5
Aug. 24	3330	918	27.4	967	130	13.5
Aug. 31	5641	1479	26.0	1489	206	13.7
Sept. 7	5033	1414	28.0	1385	207	14.9
Sept. 14	4427	1123	25.2	1480	154	10.4
Sept. 21	4738	968	20.4	1600	228	14.2
Sept. 28	4743	947	20.0	1640	302	18.4
Oct. 5	4433	776	17.5	1502	291	19.4
Oct. 12	5010	941	18.8	1664	334	20.0
Oct. 19	4681	743	15.9	1653	259	15.7

IV. Current Analysis of Influenza and Pneumonia Mortality

Table 1

Current Influenza and Pneumonia Deaths
in 108 United States Cities*

Division	Number of Cities In Study	Number of Cities Reporting this week	Deaths (including estimates**) during weeks ending Oct. 12 (107 cities)	Oct. 19 (102 cities)	Oct. 26 (106 cities)
All Divisions	108	106	484	607	777
New England	14	14	34	25	52
Mid. Atlantic	17	16	152	262	301
E. North Central	18	18	113	134	150
W. North Central	9	9	28	29	39
S. Atlantic	9	8	35	41	76
E. South Central	8	8	16	22	34
W. South Central	13	13	43	38	60
Mountain	8	8	25	20	24
Pacific	12	12	38	36	41

**The number of deaths given includes estimates for cities not reporting in a given week. The table is corrected for preceeding weeks as late figures are received. The chart will be corrected only for gross discrepancies.

Comment

Nationally, influenza and pneumonia mortality continued to rise. The Middle Atlantic and East North Central Divisions which have been well above normal levels for the last two weeks show further increases. The West Central States, both Northern and Southern Divisions, which have been slightly above normal levels, increased this week. A sharp rise occurred in the South Atlantic States, and the East South Central States exceeded the "epidemic threshold" for the first time. The Mountain States remained at a moderate elevation. Only the Pacific Division remained near normal levels.

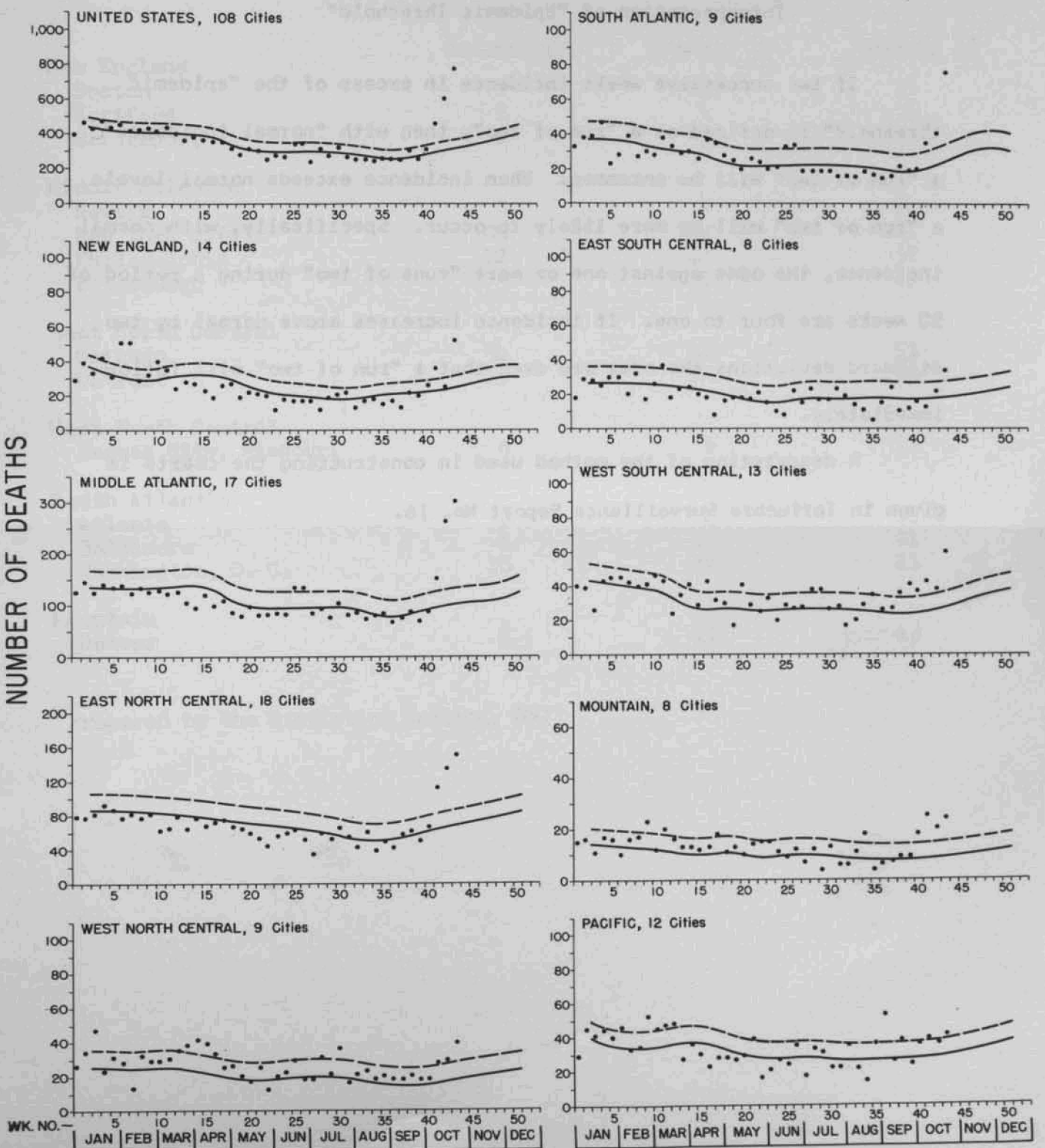
Cities with marked increases are shown in the following table.

WEEKLY PNEUMONIA AND INFLUENZA DEATHS

"EPIDEMIC THRESHOLD"

"NORMAL INCIDENCE"

(SEE EXPLANATION ON BACK OF SHEET)



DHEW - PHS - BSS - CDC

ATLANTA, GA. 68-70

SEPTEMBER, 1957

Interpretation of "Epidemic Threshold"

If two successive weeks incidence in excess of the "epidemic threshold" is defined as a "run of two", then with "normal incidence" a "run of two" will be uncommon. When incidence exceeds normal levels a "run of two" will be more likely to occur. Specifically, with normal incidence, the odds against one or more "runs of two" during a period of 52 weeks are four to one. If incidence increases above normal by two standard deviations the odds are even that a "run of two" will follow immediately.

A description of the method used in constructing the charts is given in Influenza Surveillance Report No. 16.

Cities showing marked increases in the past week were as follows:

	Week Ending		
	October 12	October 19	October 26
New England			
Boston	7	4	13
Hartford	1	1	6
Bridgeport	0	3	66
Middle Atlantic			
Newark	9	9	14
New York City	105	179	181
Philadelphia	12	19	32
Pittsburgh	5	11	23
East North Central			
Chicago	54	59	59
Detroit	19	18	23
West North Central			
Kansas City, Missouri	6	5	17
South Atlantic			
Atlanta	9	4	14
Baltimore	8	10	21
Washington, D. C.	10	12	21
Mountain			
Denver	8	10	13

*Prepared by the Statistics Section, CDC

V. Reports of Influenza-Associated Deaths

Case summaries of nine influenza-associated deaths are presented below. These deaths are reported because they demonstrate certain aspects of the disease, but they comprise only a small fraction of the deaths related to influenza in this country. Most of the reports received by CDC have involved young adults and it should be remembered that available data for gross mortality in the nation, and age distribution of deaths from New York City and New York State, do not show a high proportion of deaths in this young adult group.

There is now good evidence that influenza can be fatal in young persons without bacterial complications. Dr. Edwin Kilbourne reports that, within the last two weeks, three patients have died in New York Hospital with influenza, who had extensive pulmonary edema, necrotizing tracheo-bronchitis and intra-alveolar hemorrhage. Infection with bacterial pathogens has not been demonstrable in these patients, and influenza virus has been recovered from the lungs of each. Although these three deaths occurred in patients with rheumatic heart disease, physiologic, pathologic, and microbiologic studies thus far suggest that these deaths were not the result of simple pulmonary edema on the basis of cardiac decompensation. Four of the nine case summaries below illustrate the same phenomenon of sterile pneumonia. (Ohio-3, Ohio-4, N. J.-1, D. C.-1.) Other similar cases have been reported but absolute proof of Asian strain infection was lacking. Examination of these influenza pneumonias fails to reveal any great difference in clinical course from the complicating bacterial pneumonias. The time interval between onset and death has been remarkably short in either type.

Information about influenza cases with complications, not resulting in death, is scarce. We solicit such reports as a basis for evaluating various methods of treatment.

OHIO (Reported by Dr. W. S. Jordan, Jr., Western Reserve School of Medicine)

Ohio 1 Age 64. Negro male. Entered University Hospitals 8/14/57 for cerebrovascular accident. Improved and was ready for discharge by mid-September, but developed fever and rash on 9/19 thought to be related to gantrisin therapy for intercurrent bladder infection. At the same time (9/16 to 9/24) personnel of ward (22 out of 26) and other patients (7 out of 19) developed influenza-like illnesses. Asian strains of virus were isolated from three of ward personnel. No attempt was made to isolate virus from the patient. On 9/26, a throat culture was reported as normal flora. Chest x-rays on 9/3, 9/11, and 9/23 showed no pulmonary lesions. Remained febrile and died on 9/26. Autopsy showed a tracheobronchitis, minimal bronchopneumonia, and a healing cerebral infarct. Staphylococcus aureus, coagulase positive, was cultured from the trachea. A peripheral portion of lung yielded neither bacteria nor virus. Serum specimens obtained on 9/24 and 9/26 (post mortem) had H-I titers of 40 against the animal lines of Japan/305 virus.

Ohio 2 Age 23. Negro male. Sudden onset on 9/29 with fever, chills, cough, myalgia, and headache. Seen in E. W. of one of hospitals when temperature of 40.5° c. was only abnormal finding. Sent home on supportive therapy. He later developed pleuritic pain, more cough, green

bloody sputum and arrived at University Hospitals in extremis. Leucocyte count was 2000. Died within 4 hours. Total duration of illness about 66 hours, despite resuscitation efforts. Post mortem examination showed acute necrotizing tracheobronchitis, bilateral focal and confluent hemorrhagic pneumonia, focal and confluent myocarditis. Multiple organisms, thought to be contaminants, were isolated from lung and blood. Asian strain influenza virus was isolated from the trachea.

Ohio 3 Age 24. White female. Patient had known mitral stenosis and was five months pregnant. Admitted to University Hospitals on 10/6. Two to three weeks previously she received penicillin for 3 days for tonsillitis. On 10/3, developed fever, cough productive of watery pink sputum and orthopnea. Examination showed injected nasal and pharyngeal mucous membranes, dullness and rales on the left posteriorly and laterally, cardiac enlargement, grade 2 systolic murmur along left sternal border, and a uterus enlarged to 1 cm below umbilicus. Leucocyte count 11,200. Sputum culture: normal throat flora; blood culture: sterile. Fever persisted, dullness and rales appeared in right lung, dyspnea and cyanosis became severe, blood pressure fell and she expired 26 hours after admission. Therapy included antibiotics and steroids in addition to measures directed at cardiac failure. Autopsy showed bilateral hemorrhagic bronchopneumonia. Histologic studies have not been completed. No bacteria were recovered from post mortem culture of lungs. Asian strain viruses were isolated from both trachea and lung.

Ohio 4 Age 17. Negro female. Onset 10/5 with cough, chills, and fever. Three siblings sick simultaneously with influenza-like illnesses. In shock with marked respiratory distress at time of admission. Treated with antibiotics, pressor agents, and steroids. Died within less than three hours after admission. Throat culture showed pneumococci, not yet typed. Post mortem examination: hemorrhagic tracheobronchitis; bilateral pulmonary hemorrhage and edema. Post mortem lung culture was sterile. Asian virus was isolated from both trachea and lung.

Ohio 5 Age 10. Puerto Rican male. One of 7 siblings, most of whom became ill simultaneously with influenza-like illnesses. Three of 7, including F. D., began with epistaxis. Both parents became ill after children were symptomatic. Onset 10/9; admitted to hospital in Cleveland on 10/10. Temp. 105.4° F., respiration 40, B.P. 80/60. Acutely ill with flaring of the alae nasi, but was conscious and coherent. X-ray showed patchy, bilateral infiltration. Leucocyte count 3500. Throat culture showed moderate number of Beta hemolytic streptococci. Rapid progression to death on 10/10 within 7 hours after admission. Total duration of illness about 48 hours. Post mortem examination (gross) showed bilateral fibrinopleuritis and pulmonary edema and hemorrhage. There were hemorrhages in tonsils, submucosa of G-I tract, and tracheobronchial nodes. The adrenal cortices were thinned and congested. Non-hemolytic, gram positive cocci, probably staphylococci, were grown from the trachea. Asian strain virus was isolated from the trachea.

DISTRICT OF COLUMBIA (Reported by Dr. Crawford, Walter Reed Army Institute of Research)

D. C. 1 A 29-year-old pregnant female developed typical symptoms of influenza on September 29. On October 1, she delivered a viable male infant. Her influenzal symptoms continued and, on October 2, her temperature was 104, she became cyanotic and dyspneic. On October 4, she developed more severe respiratory difficulty and, despite a tracheotomy, died. An Asian strain of influenza virus was isolated from her lungs by the Walter Reed laboratory, but the lungs were bacteriologically sterile. Autopsy revealed a diffuse bilateral interstitial pneumonitis with pleural effusion. Hyaline membranes were found in the alveolar spaces and there was a moderate lymphocytic infiltration. Blood antibody studies are in progress on the infant, who is apparently doing well.

NEW JERSEY (Reported by Dr. C. E. Weigele, New Jersey Department of Health, and Dr. S. M. Farrer, EIS Officer)

N. J. 1 A 15-year-old white female, New Market, Middlesex County, New Jersey, awoke Monday morning, September 30, 1957, with slight fever and a dry cough. On Wednesday, October 2, the patient was seen by a local physician, who visited the patient in her home. The physician found the patient to have a temperature of 105; her pharynx was injected. The patient did not reveal any signs of pulmonary pathology on physical examination. On aspirin therapy the fever dropped to 100 by October 3. The parents of the patient reported to the physician that the patient felt fairly comfortable on October 3. At 6:45 AM on October 4 the patient was found dead in bed by her parents.

Autopsy material was forwarded to the State Laboratories for examination. Thus far the Asian strain of influenza virus has been isolated from post mortem nose and throat washings. Bacterial cultures done on the lung tissue have yielded no growth.

N. J. 2 A 4-month-old non-white infant male, Cranbury Township, Middlesex County, New Jersey, was found dead in his crib on October 6 by his parents. The family was one of a migrant labor group from the South engaged in summer farming in central New Jersey. The infant had no history of previous disease; all available information suggests that this was a sudden death in a previously healthy infant. The Asian strain of influenza virus has been isolated from post mortem nose and throat washings.

N. J. 3 A 17-year-old white male, a resident of the Woodbine State Colony for the mentally deficient, Woodbine, Cape May County, New Jersey, suddenly became ill on the morning of September 10, 1957. The patient developed a temperature of 105, dyspnea, and malaise, and was hospitalized immediately. Physical examination at the time of the hospitalization did not reveal any signs of pulmonary pathology. Nose and throat smears on September 10 were negative for C. diphtheriae and H. streptococci. Urinalysis on September 10 revealed a trace of albumin, a trace of glucose and occasional white blood cells. The white blood count on September 10 was 42,550 with a polymorphonuclear

count of 87%. The patient expired suddenly at 5:45 AM on September 11. Post mortem blood cultures were negative. No autopsy was performed.

This patient became ill during an epidemic of influenza-like illness at the Woodbine State Colony. He was one of 90 inmates in a cottage where 68 boys were in bed with fever and other symptoms of influenza-like disease. Serum samples have been collected from Woodbine but no results are available as yet.

VI. Industrial Absentee Data

During the period October 14-18, Boston, Columbus, Cincinnati, Indianapolis, and Dallas reported increases in industrial absenteeism for the first time. Note that a number (rate) is given on the table only when a variation from the normal absentee rate occurs. The increase in Boston and the Ohio cities occurred, as previously noted for other cities, some one to two weeks after the first outbreaks in schools were reported. Dallas and Indianapolis have not reported much influenza, however, to date. No cities with recent increased industrial absenteeism have returned to normal rates yet except Phoenix and Cincinnati. Since October 18, no additional cities have shown increased absenteeism so the number of the total 36 reporting increases remains at 23. Cities of the Pacific Coast and Plains States are most notable among those not yet reporting increased industrial absenteeism.

VI. Industrial Absentee Rates for 36 Cities of the United States

(Compiled from a number of sources)

City	% of Total Absent							
	Oct. 1956	Sept. 29 1957	October* 1957					
			1-5	7-11	14-18	21	22	23
Boston	6.9	-	-	-	UP	8.0	8.0	8.7
Manhattan	4.0	-	-	UP	8.6	7.7	7.6	7.0
Buffalo	6.7	-	9.4	8.4	7.2	6.7	7.3	7.7
Syracuse	6.3		UP/NR	-	7.3	7.5	7.2	6.6
Philadelphia	5.3	-	-	9.0	12.3	11.3	11.6	10.8
Pittsburgh	4.5	-	-	9.5	13.3	12.7	12.6	13.0
Washington	6.2	-	7.1	7.2**	8.6	8.5	9.7	10.2
Baltimore	5.9	-	-	UP/NR	7.1	6.4	7.4	7.9
Richmond	5.4	-	-	-	-	-	-	-
Atlanta	5.9		UP/NR	UP	7.3	6.2	6.9	7.3
Miami	10.3	-	-	-	-	-	-	-
Memphis	4.7	-	-	-	-	-	-	-
Birmingham	4.0	-	-	UP	6.6	7.7	8.5	7.6
Nashville	3.6	-	-	UP/NR	6.8	9.0	9.4	9.7
Jacksonville	8.0	-	-	-	-	-	-	-
New Orleans	6.4	-	-	-	-	-	-	-
Cleveland	4.5		-	5.0	5.3	6.4	5.6	6.4
Columbus	5.0		-	-	5.8	6.1	6.4	7.5
Cincinnati	6.0	-	-	-	UP	5.5	5.5	5.6
Detroit	6.6	-	9.8	11.4	9.1	7.7	8.7	7.9
Indianapolis	5.4	-	-	-	7.9	9.5	11.6	11.1
Milwaukee	6.3	-	-	8.0	9.2	7.9	8.4	7.9
Chicago	5.6	-	7.8	8.2**	8.4	8.0	7.8	8.1
Minneapolis	4.6	-	-	-	-	-	-	-
Omaha	5.4	-	-	-	-	-	-	-
St. Louis	3.9	-	-	-	-	-	-	-
Kansas City	4.8	-	-	-	-	-	-	-
Houston	4.0	-	-	UP/NR	7.4**	6.1	6.9	5.9
Dallas	4.3	-	-	-	4.8	5.7	5.6	6.5
Oklahoma City	3.4	-	-	-	-	-	-	-
Denver	7.9	-	10.2	11.8	10.9	9.6	9.5	11.3
Phoenix	8.0	-	10.8	9.5	8.6	9.2	7.2	7.6
Salt Lake City	4.8	-	9.8	10.5	8.9	6.3	8.4	9.5
San Francisco	9.3	-	-	-	-	-	-	-
Seattle	5.6	-	-	-	-	-	-	-
Los Angeles	5.9	-	-	-	-	-	-	-

- = normal absentee rate
UP = increased absenteeism
NR = no rate available

*5 day average rates
**4 day average rates

VII. Influenza Vaccine Production and Distribution

Influenza Vaccine Released

(Totals through October 24, 1957)

Pharmaceutical Concern	Monovalent Asian strain	Polyvalent with Asian strain
Lederle	5,672,130 ml	537,960 ml
Lilly	2,036,530	286,000
Merck, Sharpe & Dohme	7,856,490	
National Drug	5,457,335	2,054,435
Parke, Davis	298,635	
Pitman-Moore	2,956,972	

Total released to date: 27,156,487 ml
Amount released since October 16: 4,391,051 ml

Shipping Distribution:

Department of Defense 4,803,420 ml
Commercial channels 22,353,067 ml

Estimated Vaccine Production:

October 28,460,000 ml
November 40,900,000 ml
December 12,420,000 ml